

FORM PTO-1390 (Modified)  
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

990.1246

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/719029

INTERNATIONAL APPLICATION NO.  
PCT/FI99/00458INTERNATIONAL FILING DATE  
May 27, 1999PRIORITY DATE CLAIMED  
June 5, 1998

## TITLE OF INVENTION

EQUIPMENT AND METHOD IN A PAPER OR BOARD MACHINE FOR MIXING OF FRESH STOCK AND OF  
WATER FOR DILUTION OF FRESH STOCK

APPLICANT(S) FOR DO/EO/US

Jouni RAHKOMAA et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired
  - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Letter Re Priority

Submission of Application for Filing Date Without Declaration

U.S. APPLICATION NO. <b>09/719029</b> INTERNATIONAL APPLICATION NO. <b>PCT/FI99/00458</b>		ATTORNEY'S DOCKET NUMBER <b>990.1246</b>																																																							
21. The following fees are submitted: <b>BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :</b> <input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$970.00</b> <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$840.00</b> <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$690.00</b> <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$670.00</b> <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$96.00</b> <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>		<b>CALCULATIONS PTO USE ONLY</b>																																																							
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">CLAIMS</th> <th style="width: 25%;">NUMBER FILED</th> <th style="width: 25%;">NUMBER EXTRA</th> <th style="width: 35%;">RATE</th> </tr> </thead> <tbody> <tr> <td>Total claims</td> <td>20 - 20 =</td> <td>0</td> <td>x \$18.00</td> </tr> <tr> <td>Independent claims</td> <td>3 - 3 =</td> <td>0</td> <td>x \$80.00</td> </tr> <tr> <td colspan="3">Multiple Dependent Claims (check if applicable). <input type="checkbox"/></td> <td>\$0.00</td> </tr> <tr> <td colspan="3" style="text-align: right;"><b>TOTAL OF ABOVE CALCULATIONS =</b></td> <td><b>\$1,130.00</b></td> </tr> <tr> <td colspan="3">Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/></td> <td>\$0.00</td> </tr> <tr> <td colspan="3" style="text-align: right;"><b>SUBTOTAL =</b></td> <td><b>\$1,130.00</b></td> </tr> <tr> <td colspan="3">Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).</td> <td>+</td> </tr> <tr> <td colspan="3" style="text-align: right;"><b>TOTAL NATIONAL FEE =</b></td> <td><b>\$1,130.00</b></td> </tr> <tr> <td colspan="3">Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/></td> <td>\$0.00</td> </tr> <tr> <td colspan="3" style="text-align: right;"><b>TOTAL FEES ENCLOSED =</b></td> <td><b>\$1,130.00</b></td> </tr> <tr> <td colspan="2"></td> <td style="text-align: right;">Amount to be refunded</td> <td>\$</td> </tr> <tr> <td colspan="2"></td> <td style="text-align: right;">charged</td> <td>\$</td> </tr> </tbody> </table>		CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	Total claims	20 - 20 =	0	x \$18.00	Independent claims	3 - 3 =	0	x \$80.00	Multiple Dependent Claims (check if applicable). <input type="checkbox"/>			\$0.00	<b>TOTAL OF ABOVE CALCULATIONS =</b>			<b>\$1,130.00</b>	Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>			\$0.00	<b>SUBTOTAL =</b>			<b>\$1,130.00</b>	Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).			+	<b>TOTAL NATIONAL FEE =</b>			<b>\$1,130.00</b>	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>			\$0.00	<b>TOTAL FEES ENCLOSED =</b>			<b>\$1,130.00</b>			Amount to be refunded	\$			charged	\$	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; vertical-align: top;"> <input checked="" type="checkbox"/> A check in the amount of <b>\$1,130.00</b> to cover the above fees is enclosed.   <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.            A duplicate copy of this sheet is enclosed.   <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. <b>50-0518</b> A duplicate copy of this sheet is enclosed.         </td> <td style="width: 40%; vertical-align: top;">           By <u><i>MR</i></u>            Paul J. Higginson            Reg. No. 44,152         </td> </tr> </table>		<input checked="" type="checkbox"/> A check in the amount of <b>\$1,130.00</b> to cover the above fees is enclosed.  <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.  <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. <b>50-0518</b> A duplicate copy of this sheet is enclosed.	By <u><i>MR</i></u> Paul J. Higginson Reg. No. 44,152
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SEND ALL CORRESPONDENCE TO:																																																									
<b>STEINBERG &amp; RASKIN, P.C.</b> 1140 Avenue of the Americas, 15th Floor New York, New York 10036-5803		SIGNATURE <u>Martin G. Raskin</u> NAME <b>25,642</b> REGISTRATION NUMBER <b>December 5, 2000</b> DATE																																																							

990.1246

**UNITED STATES PATENT AND TRADEMARK OFFICE**

Re: Application of: Jouni RAHKOMAA et al.  
Serial No.: Not yet known  
Filed: Simultaneously  
For: **EQUIPMENT AND METHOD IN A  
PAPER OR BOARD MACHINE FOR  
MIXING OF FRESH STOCK AND OF  
WATER FOR DILUTION OF FRESH  
STOCK**

**PRELIMINARY AMENDMENT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

December 5, 2000

Sir:

Prior to examination, please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

Please amend the specification as follows. (reference is made to the lines as numbered).

Page 1, line 6, insert --**FIELD OF THE INVENTION**--;

line 10, insert --**BACKGROUND OF THE INVENTION**--; and

line 15, insert --**OBJECTS AND SUMMARY OF THE INVENTION**--.

Page 2, before line 1, insert --**BRIEF DESCRIPTION OF THE DRAWINGS**--.

Page 3, line 5, insert --**DETAILED DESCRIPTION OF THE INVENTION**--;

line 13, after “pipe”, insert --13--;

line 16, change “the tank 100”, first occurrence to --a wire pit tank 10--;

line 16, change “tank 100”, second occurrence to --wire pit tank 10--; and

line 26, after “outside”, insert --of the circumference--.

Page 4, line 5 to line 6, change “pit 10. Into” to --pit 10 and into--;

line 6, change “wire pit 10, besides” to --wire pit 10. In addition to the--; and

line 9, after “L<sub>3</sub>” insert --(as seen in Fig. 1D)--.

Page 6, after line 7, insert:

-- In the following, the patent claims will be given, and the various details of the invention can show variation within the scope of the inventive idea defined in the claims and differ even to a considerable extent from the details stated above by way of example only. As such, the examples provided above are not meant to be exclusive and many other variations of the present invention would be obvious to those skilled in the art, and are contemplated to be within the scope of the appended claims.--

## **IN THE DRAWINGS**

In Fig. 1A, reference numeral “100” has been changed to reference numeral “10” to reflect the changes made to page 3 of the specification and to remove an ambiguity in the numbering of the elements. The change has been made in red ink.

**IN THE CLAIMS:**

Please amend the claims as follows.

1. (Amended) An equipment in a paper or board machine for mixing fresh stock (M) with water (V) used for dilution of the fresh stock, [characterized in that] comprising:

at [the] a point of mixing (K) of the dilution water (V), passed from a dilution water pipe (11), and the fresh stock (M), passed from [the] a fresh stock pipe (13), there is at least one such pipe portion [as comprises] having a wave-shaped form in its connection in [the] a cross-section of the pipe.

Claim 2, line 1, change “characterized in that” to --wherein--.

Claim 3, line 1, change “or 2, characterized in that” to --wherein--;

line 2, before “comprises”, insert --further--; and

line 2, change “the”, first occurrence, to --a--.

4. (Amended) An equipment as claimed in [any of the preceding claims, characterized in that] claim 1, wherein the dilution water pipe (11) [is provided with] further comprises:

a wave-shaped form on [its] a wall face thereof.

Claim 5, line 1, change “characterized in that” to --wherein--; and

line 2, change “the”, first occurrence, to --an--.

Claim 6, line 1, change “any of the preceding claims, characterized in that” to --claim 3, wherein--.

Claim 7, line 1, change “any of the preceding claims, characterized in that” to --claim 3, wherein--.

Claim 8, line 1, change “characterized in that” to --wherein--;

line 2, change “the”, second occurrence, to --a--;

line 2, delete “pipe”, second occurrence; and

line 2, after “portion”, insert --of pipe--.

9. (Amended) An equipment as claimed in [any of the preceding claims, characterized in that] claim 1, wherein the [duct] white water pipe (11) further comprises:  
a pump (P) placed after the mixing point (K) of the white water, fresh stock, and a circulation water in view of passing said materials into [the] a headbox (100) of the paper/board machine.

Claim 10, line 1, change “any of the preceding claims, characterized in that” to --claim 1, wherein--; and

line 2, change “the”, second occurrence, to --a--.

Claim 11, line 1, change “characterized in that” to --wherein--;

line 2, change “the”, second occurrence, to --a--;

line 2, delete “(100)”; and

line 2, change “the”, third occurrence, to --a--.

12. (Amended) A method in a paper or board machine for mixing fresh stock (M) with water (V) used for dilution of the fresh stock, [characterized in that] comprising the step of:  
forming secondary vortices at [the] a point of mixing (K) of the dilution water (V) [used for dilution of fresh stock (M)], passed from a dilution water pipe (11), and the fresh stock (M), passed from [the] a fresh stock pipe (13), [secondary vortices are formed, which] said vortices [are] being formed by means [of a wave-shaped face form of] at least one of said pipes [the pipe] having at least an end portion with a wave-shaped cross-section.

Claim 13, line 1, change “characterized in that” to --wherein--.

Claim 14, line 1, change “characterized in that” to --wherein--;

line 2, change “the”, first occurrence, to --a--;

line 2, delete “(100)”; and

line 2, change “the”, second occurrence, to --a--.

Please add the following new claims.

- 15. An equipment for the improved mixing and diluting of a fresh stock (M) with a white water (V) in a paper or board machine, comprising:
- a white water pipe (11) for conducting said white water (V);
  - a fresh stock pipe (13) structured and arranged to feed said fresh stock (M) coaxially into said white water pipe (11) at a mixing point; and
  - at least one of said white water pipe (11) and said fresh stock pipe (13) having at least a portion which has a transverse cross-section that is wave-shaped, said portion being located at said mixing point between said fresh stock (M) and said white water (V), whereby said wave-shape produces secondary vortexes in said flow of fresh stock and flow of white water in order to enhance the mixing and diluting of said fresh stock flow with said white water flow.
16. The equipment according to claim 15, further comprising:
- a return circulation water pipe (12) is structured and arranged to coaxially conduct a return circulation water (O), through said white water pipe (11), to said mixing point between said fresh stock (M) and said white water (V); and
  - wherein said fresh stock pipe (13) is structured and arranged to coaxially conduct said fresh stock (M) into said return circulation water pipe (12), to said mixing point between said fresh stock (M) and said white water (V).



17. The equipment according to claim 15, wherein said wave-shape is formed on an inner surface of said white water pipe, wherein said wave-shape comprises a plurality of spaced form pieces extending radially inward from said inner surface of said white water pipe.

18. The equipment according to claim 17, wherein said form pieces have a curved cross section.

19. The equipment according to claim 16, wherein said fresh stock pipe (13), structured and arranged coaxially within said return circulation water pipe (12), is provided with said wave-shape formed along an inner circumferential surface and an outer circumferential surface thereof, whereby said return circulation water (O), conducted through said return circulation water pipe (12), is conducted over said wave-shape formed along said outer circumferential surface of said fresh stock pipe (13) and whereby said fresh stock (M), conducted through said fresh stock pipe (13), is conducted over said wave-shape formed along said inner circumferential surface of said fresh stock pipe (13), thereby producing secondary vortexes in said return circulation water (O) and said fresh stock (M).

20. The equipment according to claim 16, wherein said return circulation pipe (12), structured and arranged coaxially within said white water pipe (11), is provided with said wave-shape formed along an inner circumferential surface and an outer circumferential surface thereof, whereby said return circulation water (O), conducted through said return circulation water pipe (12), is conducted over said wave-shape formed along said inner circumferential surface of said return circulation pipe (12) and whereby said white water (V), conducted through said white water pipe (11), is conducted over said wave-shape formed along said outer circumferential surface of said return circulation pipe (12), thereby producing secondary vortexes in said return circulation water (O) and said white water (V).--

**REMARKS**

The specification has been amended to include section headings at appropriate locations.

In Fig. 1A, reference numeral "100" has been changed to reference numeral "10" to reflect the changes made to page 3 of the specification and to remove an ambiguity in the numbering of the elements. The change has been made in red ink.

Claims 1-14 as filed in the corresponding International Patent Application have been amended to correct minor informalities and to remove multiple dependencies in order to reduce the filing fee. New claims 15-20 have been added which are directed to embodiments disclosed in the original specification. No new matter has been added.


The invention is new, useful and non-obvious.

Respectfully submitted,

STEINBERG & RASKIN, P.C.



Martin G. Raskin  
Reg. No. 25,642

34/11   
Paul J. Higgins  
Reg. No. 44,152

Steinberg & Raskin, P.C.  
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(212) 768-3800

Encl.

Equipment and method in a paper or board machine for mixing of  
fresh stock and of water for dilution of fresh stock

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The invention concerns an equipment and a method in a paper or board machine for mixing fresh stock used for manufacture of paper or board with water used for dilution of the fresh stock.

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From the prior art, a solution of equipment is known in which fresh stock and a return circulation are passed into a narrowing duct after the wire pit in a paper or board machine. An essential feature of the system is good mixing of fresh stock, white water, and the return circulation.

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In an attempt to obtain good mixing of the white water of the short circulation and of fresh stock in a paper/board machine, in the present patent application it is suggested that, in the area in the duct after the wire pit in which the fresh stock is introduced, at least one duct comprises, on its face, a duct form that is wave-shaped in a cross-section perpendicular to the longitudinal axis of the flow duct. Said wave-shaped duct form produces secondary vortexes in the flow, which vortexes result in efficient mixing of the flows.

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The equipment in accordance with the present invention is characterized in that, at the point of mixing of the dilution water and the fresh stock passed from the pipe, there is at least one such pipe portion as comprises a wave-shaped form in its connection in the cross-section of the pipe.

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The method in accordance with the invention is characterized in that, at the point of mixing of the water used for dilution of fresh stock and the fresh stock passed from the pipe, secondary vortexes are formed, which are formed by means of a wave-shaped face form of the pipe.

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The invention will be described in the following with reference to some preferred embodiments of the invention illustrated in the figures in the accompanying drawings, the invention being, yet, not supposed to be confined to said embodiments alone.

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Figure 1A illustrates a common embodiment of the invention, in which a water in general, which has been meant for dilution of stock, and a high-consistency stock are mixed while making use of a wave-shaped pipe form.

10 Figure 1B is a sectional view taken along the line IV - IV in Fig. 1A on an enlarged scale.

Figure 1C is an illustration of principle of the short circulation in a paper/board machine, in which white water that has been recovered as retention is passed into the wire pit, white water being passed from the bottom of the wire pit as a return circulation into the headbox.

15 Figure 1D is an illustration on a larger scale of an arrangement of equipment in accordance with the invention in which feed pipes of stock and of the return circulation are passed into connection with the white water passed from the bottom portion of the wire pit.

20 Figure 2A shows a first embodiment of the invention, in which the wave-shaped form has been formed onto the inner wall of the pipe 11 connected with the wire pit.

25 Figure 2B is a sectional view taken along the line I—I in Fig. 2A.

Figure 3A shows a second embodiment of the invention, in which the wave shape has been formed onto a pipe 13 passed in the interior of the pipe 12.

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Figure 3B is a sectional view taken along the line II—II in Fig. 3A.

Figure 4A shows an embodiment of the invention, in which the wave-shaped form has been formed onto the pipe 12.

Figure 4B is a sectional view taken along the line III—III in Fig. 4A.

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Fig. 1A illustrates the commonest embodiment of the invention, in which the water V used for dilution of fresh stock M is passed through the pipe 11, and the high-consistency fresh stock M is passed through the pipe 13. At the end of the pipe 13 and after said end, the high-consistency stock M and the water V used for dilution of the stock are mixed with each other owing to the wave formation in accordance with the invention at the end of the pipe 13. In the embodiment shown in Fig. 1A, the wave form extends both to the interior of the pipe 13 and to the outer face of the pipe, in which case the mixing of the water V used for dilution of the fresh stock M with the fresh stock M is efficient. The water passed along the pipe 11 and used for dilution of the stock is favourably white water, which is passed, in the way shown in Fig. 1A, from the tank 100. As is shown in the figure, the tank 100 is a deaeration tank of the short circulation in a paper or board machine, into which tank the white water V is passed from a separate intermediate tank. Thus, in the commonest embodiment of the invention, by means of the wave-shaped pipe construction 13, in general, the high-consistency fresh stock M and the water V that dilutes said stock are mixed with each other efficiently, and the dilution water favourably consists of the white water of the short circulation in the paper/board machine.

Fig. 1B is a sectional view taken along the line IV—IV in Fig. 1A. As is shown in the figure, the line of supply of the high-consistency stock, preferably a pipe 13, is provided with a wave formation at its end. The waves extend both inside and outside the pipe 13, in which case they act both upon the fresh stock M flowing in the pipe 13 and upon the stock dilution water V, favourably white water, flowing outside the pipe 13.

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Fig. 1C is an illustration of principle of the use of the white-water pit of the short circulation in a paper or board machine in collecting of retention waters and in

recycling of fibrous white water, in which connection the fresh stock M and the water O of the return circulation are passed into connection with the white water V and in which construction, further, the combined mixed flow is passed from the wire pit 10 into connection with the headbox 100 of the paper or board machine. As is shown in Fig. 1C, the white waters are passed from the wire into the wire pit 10. Into the duct 11 placed at the bottom of the wire pit 10, besides white water V from the wire pit 10, the water O of the return circulation from the tank F and the fresh stock M from the stock tank S are also passed. By means of a pump P, the combined flow  $L_1 + L_2 + L_3$  is passed further into the headbox 100.

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At the bottom of the wire pit, in accordance with the invention, the white water is mixed with the fresh stock and with the water of the return circulation, which water is, for example, a bypass flow circulation from the headbox or an accept from the second stage of vortex cleaning. The sequence of consistencies is as follows. The highest consistency is that of the high-consistency stock. The next consistency is that of the water from the return circulation, and the lowest consistency is that of the white water (white water < return circulation < high-consistency stock).

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Fig. 1D shows an equipment in accordance with the invention, in which, in the way indicated by the arrow  $L_1$ , the fibrous water is passed from the white-water pit 10 back to circulation into the pipe 11. Into the pipe 11, also fresh stock M is passed from the pipe 13, and the water O of the return circulation is passed from the pipe 12. The pipe 12 has been passed into the interior of the pipe 11 in an area in which the pipe 11 is curved and its cross-sectional flow area becomes narrower. Through the pipe 12, the return circulation, i.e. the water O of the return circulation, is passed (arrow  $L_2$ ) into connection with the white water V. Centrally in the interior of the pipe 12, there is the pipe 13. The pipe 13 has been passed coaxially in the interior of the pipe 12. Through the pipe 13 (arrow  $L_3$ ) the fresh stock M is passed into connection with the water O of the return circulation and with the white water V passed from the wire pit 10. Thus, in the narrowing flow passage in the pipe 11, in the area K, the stock M, the return circulation water O, and the white water V are mixed. As is shown in the figure, the pump P produces suction in the pipe 11, and

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by means of the pump P the combined flow  $L_1 + L_2 + L_3$  of the components V, M, O is passed further into connection with the headbox 100 of the paper/board machine.

- 5 In order that the mixing of the stock M and of the return circulation water O and of the white water V should be as efficient and complete as possible, in the area K of mixing of the flows  $L_1$ ,  $L_2$  and  $L_3$ , at least one of the pipes 11, 12 or 13 is provided with a wave-shaped face form in a cross-section perpendicular to the longitudinal axis of the flow duct. Said wave-shaped face form produces what is called secondary  
10 vortexes, which promote the mixing together of the flows  $L_1$ ,  $L_2$  and  $L_3$ .

Fig. 2A is a longitudinal sectional view of the mixing area K and of a first preferred embodiment of the invention. Fig. 2B is a sectional view taken along the line I - I in Fig. 2A. Figs. 2A and 2B show an embodiment in which the pipe 11 has been  
15 provided with form pieces  $a_1, a_2, a_3, \dots$ , whose outer circumference becomes narrower in wedge shape, which have been fitted on the inner face of the pipe 11, and which have been further shaped so that, as shown in the cross-sectional view, the maximal height of the wedge part  $a_1, a_2, a_3, \dots$  that produces the wave shape, in the middle of the wedge part  $a_1, a_2, \dots$ , is placed in the area of the end of the pipe 12 that passes  
20 the water O of the return circulation. The pipe 13 that passes the stock M projects further from the interior of the pipe 12.

Fig. 3A is a longitudinal sectional view of a second embodiment of the invention. Fig. 3B is a sectional view taken along the line II—II in Fig. 3A.

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In the embodiment shown in Figs. 3A and 3B, the wave shape has been formed onto the central pipe 13 fitted inside the pipe 12. The pipe 13 projects from the pipe 12. Thus, secondary vortexes are produced both in the flow  $L_2$  of the return circulation water O inside the pipe 12 and in the flow  $L_3$  of fresh stock M inside the pipe 13.  
30 Thus, by means of the wave-shaped face of the pipe 13, an effect that produces secondary vortexes is applied both to the return circulation water O flowing in the pipe 12 and to the stock M that flows in the pipe 13.



Fig. 4A is a longitudinal sectional view of a third preferred embodiment of the invention. Fig. 4B is a sectional view taken along the line III—III in Fig. 4A.

5 Figs. 4A and 4B show an embodiment of the invention in which the wave shape has been formed onto the flow pipe 12 so that the wave shape acts upon the flow  $L_1$  of white water V in the pipe 11 and upon the flow  $L_2$  of the return circulation water O in the pipe 12.

## Claims

1. An equipment in a paper or board machine for mixing fresh stock (M) with water (V) used for dilution of the fresh stock, **characterized** in that, at the point of mixing (K) of the dilution water (V) and the fresh stock (M) passed from the pipe (13), there is at least one such pipe portion as comprises a wave-shaped form in its connection in the cross-section of the pipe.
2. An equipment as claimed in claim 1, **characterized** in that the dilution water (V) consists of white water.
3. An equipment as claimed in claim 1 or 2, **characterized** in that the equipment comprises a pipe (12) for passing the return circulation water (O) to the mixing point (K) of fresh stock (M) and white water (V), and that the pipe (13), through which the stock (M) is passed, has been passed coaxially in the interior of the pipe (12).
4. An equipment as claimed in any of the preceding claims, **characterized** in that the pipe (11) is provided with a wave-shaped form on its wall face.
5. An equipment as claimed in the preceding claim, **characterized** in that the wave shape on the inner face of the pipe (11) has been produced by means of form pieces ( $a_1, a_2, a_3 \dots$ ), which form pieces are of curved cross-section and which have been fitted at a distance from one another on the circumferential measure of the pipe (11) on the inner face of the pipe (11).
6. An equipment as claimed in any of the preceding claims, **characterized** in that the pipe (13), which is placed in the interior of the pipe (12), is provided with a wave-shaped face form, in which case the return circulation water (O) that is passed in the pipe (12) is confined by the wave-shaped outer shape of the pipe (13), and the stock (M) that is passed in the pipe (13) is confined by the wave-shaped inner shape of the pipe (13).

7. An equipment as claimed in any of the preceding claims, **characterized** in that the pipe (12), through which the return circulation water (O) is introduced in the pipe (11), is provided with a wave shape, whose form is provided both on the inner face and on the outer face of the pipe, in which connection both the white water (V) flowing in the pipe (11) and the return circulation water (O) passed in the pipe (12) are confined by said wave shape.
8. An equipment as claimed in the preceding claim, **characterized** in that the pipe (12) and the pipe (13) have been passed through the curved pipe portion (11) placed below the white-water pit (10) so that the pipes (12 and 13) have been passed through the wall of the pipe (11), and that the pipe (13) projects from the end of the pipe (12), and that the pipe (13) is placed centrally inside the pipe (12).
9. An equipment as claimed in any of the preceding claims, **characterized** in that the duct (11) comprises a pump (P) placed after the mixing point (K) of white water, fresh stock, and circulation water in view of passing said materials into the headbox (100) of the paper/board machine.
10. An equipment as claimed in any of the preceding claims, **characterized** in that the pipe (11) becomes narrower in the flow direction of the flow ( $L_1 + L_2 + L_3$ ).
11. An equipment as claimed in claim 2, **characterized** in that the white water (V) that is used as the dilution water is passed from the deaeration tank (100) of the short circulation in the paper/board machine.
12. A method in a paper or board machine for mixing fresh stock (M) with water (V) used for dilution of the fresh stock, **characterized** in that, at the point of mixing (K) of the water (V) used for dilution of fresh stock (M) and the fresh stock (M) passed from the pipe (13), secondary vortexes are formed, which are formed by means of a wave-shaped face form of the pipe (11 and/or 12 and/or 13).

13. A method as claimed in claim 12, **characterized** in that white water is used as the dilution water (V).

14. A method as claimed in the preceding claim, **characterized** in that the white  
5 water is passed from the deaeration tank (100) of the short circulation of the white water in the paper/board machine.

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> :  
D21F 1/08

A1

(11) International Publication Number: WO 99/64666

(43) International Publication Date: 16 December 1999 (16.12.99)

(21) International Application Number: PCT/FI99/00458

(22) International Filing Date: 27 May 1999 (27.05.99)

(30) Priority Data:  
981286 5 June 1998 (05.06.98) FI

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(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

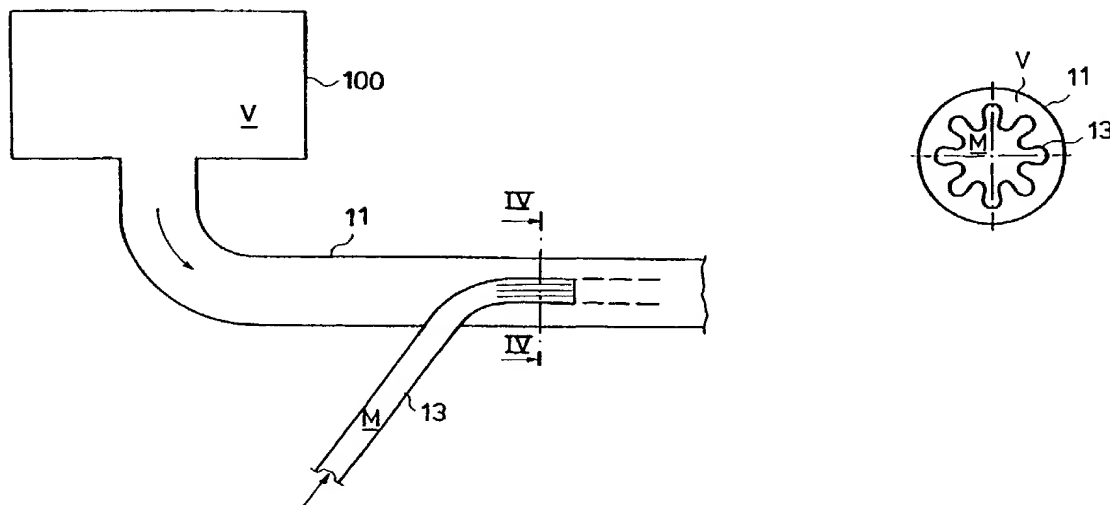
## Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

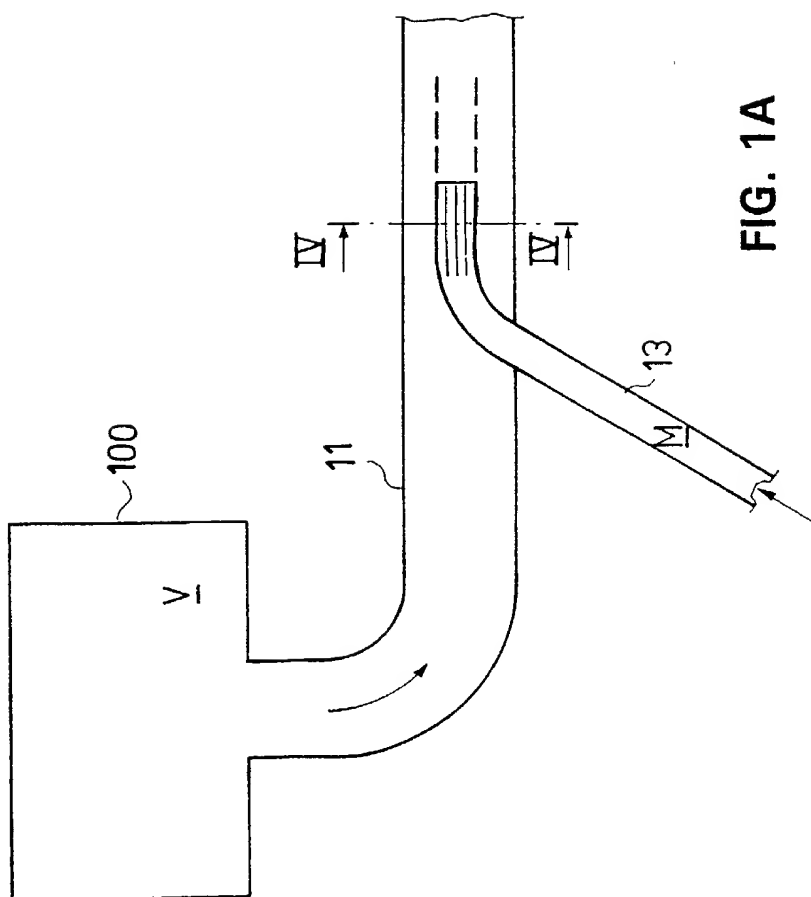
In English translation (filed in Finnish).

(54) Title: EQUIPMENT AND METHOD IN A PAPER OR BOARD MACHINE FOR MIXING OF FRESH STOCK AND OF WATER FOR DILUTION OF FRESH STOCK

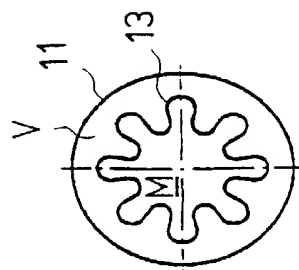


## (57) Abstract

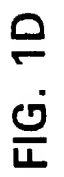
The invention concerns an equipment and a method in a paper or board machine for mixing fresh stock (M) with water (V) used for dilution of the fresh stock. At the point of mixing (K) of the dilution water (V) and the fresh stock (M) passed from the pipe (13), there is at least one such pipe portion as comprises a wave-shaped form in its connection in the cross section of the pipe.



**FIG. 1A**



**FIG. 1B**



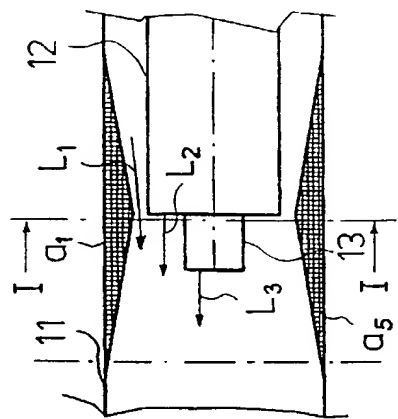


FIG. 2A

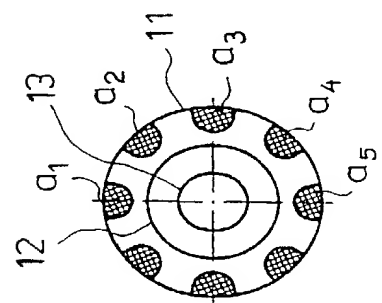


FIG. 2B

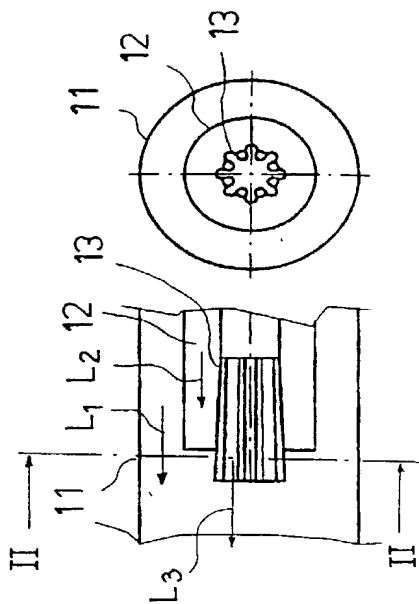


FIG. 3A

FIG. 3B

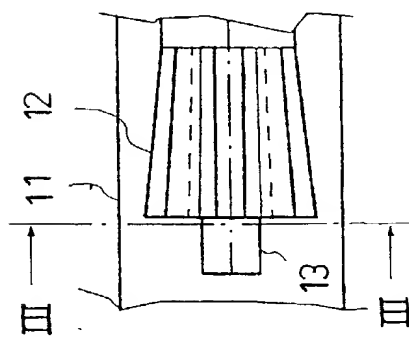


FIG. 4A

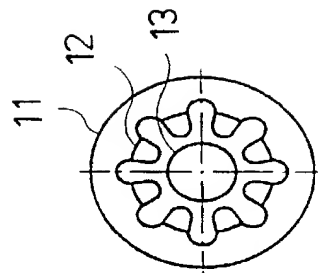


FIG. 4B



Docket No.: 99 1246

A f

**U.S.A.  
DECLARATION AND POWER OF ATTORNEY**

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: **Equipment and method in a paper or board machine for mixing of fresh stock and of water for dilution of fresh stock**

the specification of which (check one)

       is attached hereto.

  X   was filed on December 5, 2000 as Application Serial No 09/701,029 and was amended on 12/05/00 (if applicable). I Hereby authorize and request my attorney, Steinberg & Raskin, P.C. of 1140 Avenue of the Americas, New York, New York 10036 to insert the filing date and application number when known.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is known to us to be material to the patentability of this application as defined in Title 37, Code of Federal Regulations §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 of any foreign and/or provisional application(s) for patent or inventor's certificate listed below and have also identified below any foreign and/or provisional application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR APPLICATION(S)

Priority claimed

981286

Finland

June 5, 1998

X

Yes

No

I Hereby claim the benefit under Title 35, United States Code, §120 of any United States applications(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/FI99/00458

May 27, 1999

pending

